ASSESSMENT OF FETAL OUTCOME IN HYPERTENSIVE DISORDERS COMPLICATING PREGNANCY

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DECLARATION

I declare that this dissertation entitled **"ASSESSMENT OF FETAL OUTCOME IN HYPERTENSIVE DISORDERS COMPLICATING PREGNANCY"** has been conducted by me at the Department of Obstetrics & Gynaecology and the Department of Paediatrics, Government Raja Mirasdar Hospital, Thanjavur attached to Thanjavur Medical College, under the guidance and supervision of my unit Chief and Head of Department **Prof. Dr. S. SELLARAMAN, M.D.,DCH., Prof. Dr. N. GANGA, M.D., DCH., DNB.,** and **Prof. Dr. V. ILAKKUMI, M.D., DCH.** It is submitted in part fulfillment of the award of the degree of M.D.(Paediatrics) for the March 2007 Examination to be held under the TamilNadu Dr. M.G.R. Medical University, Chennai. This has not been submitted previously by me for the award of any degree or diploma from any other university.

(Dr. V.S.SUBBURAMAN)

C E R T I F I C A T E

Certified that this dissertation entitled **"ASSESSMENT OF FETAL OUTCOME IN HYPERTENSIVE DISORDERS COMPLICATING PREGNANCY"** is the bonafide work done by Dr. V.S.SUBBURAMAN M.D. Post-Graduate student of Paediatric medicine, Government Raja Mirasdar Hospital, Thanjavur, attached to Thanjavur Medical College, Thanjavur during the academic year 2004-2007.

Professor and Head of the department,

Department of Paediatric Medicine,

Thanjavur Medical College,

Thanjavur.

The Dean

Thanjavur Medical College,

Thanjavur.

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ABBREVIATIONS

PIH	-	Pregnancy Induced Hypertension
APE	-	Antepartal Eclampsia
IPE	-	Intrapartal Eclampsia
SGA	-	Small for Gestational Age
AGA	-	Appropriate for gestational Age
LGA	-	Large for gestational Age
DB	-	Dead born
LB	-	Live birth
Aldo	-	α - methyl dopa
Nife	-	Nifedipine
$Mgso_4$	-	Magnesium sulfate
APH	-	Antepartal haemorrhage
HIV	-	Human Immunodeficiency virus
NB	-	New born
G	-	Gravida
Primi	-	Primigravida
Multi	-	Multigravida
LN	-	Labour Naturalis

LSCS	-	Lower segment caesarian section
HT	-	Hypertension
IMNCI	-	Integrated management of newborn and childhood illness
AST	-	alanine aminotransferase
ALT	-	aspartate aminotransferase
LDH	-	lactate dehydrogenase
BP	-	blood pressure
CNS	-	central nervous system
DIC	-	disseminated intravascular coagulation

INTRODUCTION

The maternal well being, freedom from nutritional and systemic disorders are essential to provide an optimal in-utero environment for proper growth and development of fetus. In general fetus is well protected and insulated against adverse physical, chemical, and zoological, insults. Hypertensive disorders complicating pregnancy is one of those conditions which may jeopardize not only the maternal health but also fetal well being. It forms one of the deadly triad along with hemorrhage and infection.

Classification

There are five types of hypertensive disorders complicating pregnancy

1. Gestational hypertension (known as pregnancy induced hypertension)
2. Preeclampsia
3. Eclampsia
4. Preeclampsia superimposed on chronic hypertension
5. Chronic hypertension

TABLE – 1

Diagnosis of Hypertensive Disorders Complicating Pregnancy[1]

Gestational hypertension:

BP ≥ 140/90 mm Hg for first time during pregnancy

No proteinuria

BP returns to normal < 12 weeks postpartum

Final diagnosis made only postpartum

May have other signs or symptoms of preeclampsia, for example, epigastric discomfort or thrombocytopenia

Preeclampsia

Minimum criteria

BP ≥ 140/90 mm Hg after 20 weeks gestation

Proteinuria ≥ 300 mg/24 hours or ≥ 1+dispstick

Increased certainty of preeclampsia

BP ≥ 160/110mg Hg

Proteinuria 2.0 g/24 hours or ≥ 2+dispstick

Serum creatinine > 1.2 mg/dl unless known to be previously elevated

Platelets < 100,000/mm^3

Microangiopathic hemolysis (increased LDH)

Elevated ALT or AST

Persistent headache or other cerebral or visual disturbance

Persistent epigastric pain

Eclampsia

Seizures that cannot be attributed to other causes in a woman with preeclampsia

Superimposed Preeclampsia (on chronic hypertension)

New onset proteinuria ≥ 300 mg/24 hours in hypertensive women but no proteinuria before 20 weeks gestation

A sudden increase in proteinuria or blood pressure or platelet count < 100,000/mm^3 in women with hypertension and proteinuria before 20 weeks gestation

Chronic Hypertension

BP ≥ 140/90 mm Hg before pregnancy or diagnosed before 20 weeks gestation not attributable to gestational trophoblastic disease

Or

Hypertension first diagnosed after 20 weeks gestation and persistent after 12 weeks postpartum.

Incidence and risk factors

Incidence varies from 8 – 10 %

Risk factors:-

1. Parity: PIH more common in nulliparous women.
2. Race and ethnicity:

   familial tendency to the development of both eclampsia and preeclampsia suggesting a genetic predisposition
3. Complications of pregnancy:

   Preclampsia more in multiple pregnancy, hydramnios, vesicular mole etc
4. Diseases complicating pregnancy:

   Risk of preeclampsia is increased in maternal diabetes, hypertension, and renal disorders.

5. Emotional stress and environmental factors may contribute as a risk factor
6. Age>40

7. Genetic thrombphilias have been associated with severe preeclampsia

Pathogenesis of preeclampsia / eclampsia

Normal pregnancy is characterized by a marked increase in plasma volume, glomerular filtration rate and renel blood flow. There is considerable increase in total body sodium and also an expansion of the extracellular blood space in which the extra sodium is located. In contrast, preeclampsia is characterized by a reduced volume, reduced glomerular filtration rate and renal blood flow. There is sodium retention and a shift of sodium into the arterial walls which may be a factor in the increased sensitivity to pressor agents in preeclampsia.

Vasospasm is basic to pathophysiology of preeclampsia and eclampsia. Vascular contriction causes resistence to blood flow and accounts for the development of arterial hypertension. It is likely that vasospasm also exerts a damaging effect in vessels. AngionsinII causes endothelial cells to contract and these vascular changes with local

hypoxia of the surrounding tissues lead to hemorrhage, necrosis and other end organ disturbances observed in severe preeclampsia.

Etiology

1. increased ratio of thromboxane to prostocyclin
2. abnormal trophoblast invasion
3. cardiovascular maladaptation.
4. increased circulating lipid peroxide which may inhibit endogenous nitric oxide
5. endothelial cell injury
6. vasculitis-due to circulating immune complexes

Investigations:

- Routine investigations done in normal pregnancy
- Urine examination:
- microscopic examination for the presence of casts.
- estimation of 24 hrs urinary protein
- Blood biochemistry:

  Blood urea, Uric acid, Creatinine
- platelet count
- Liver function test
- Optic fundi examination

Complication of preeclampsia

- Maternal mortality
- Maternal morbidity
    a) CNS complication(eg strokes, seizures, intracerebral hemorrhage, blindness)
    b) DIC
    c) Hepatic failure or rupture, pulmonary edema
    d) Abruption placenta
    e) HELLP syndrome
- Fetal Mortality
- Fetal morbidity
    i) IUGR
    ii) Fetal acidemia
    iii) Complications from prematurity

Complication of eclampsia

- Injuries
- cerebral hemorrhage
- hyperpyrexia
- renal failure
- pulmonancy edema
- puerperal infection, puerperal psychosis

- aspiration preumonitis

Management

Gestational hypertension:

BP checkup in AN clinic- If>140/90, do urine examination to look for proteinuria – If no proteinuria, patient is managed as an outpatient with frequent check up of BP and admitted if there is a rise in BP or if there is IUGR.

Antihypertensive therapy may be indicated if the diastolic BP exceeds 100 mmHg

Mild preeclampsia:

- Better to hospitalize – evaluate her and the fetus
- Rest in bed throughout the great part of the day and night – Lying in left
- lateral position to improve uterine blood flow and help in fetal growth.
- Diet: Normal diet – no salt restriction
- Diuretics: If pulmonary edema or congestive heart failure present.
- Monitoring of mother: BP, urine, other investigations
- Monitoring of fetus: Assessment of fetus- clinically as well as sonologically
- If gestation < 37 weeks:

If diastolic BP settles & insignificant proteinuria-patient allowed to go

home, continue rest, BP check up regularly, report to hospital if develops

significant swelling or develops symptoms of severe preeclampsia

- If gestation more than 37 weeks

If any sign of fetal compromise-labour is induced

If no fetal compromise and the preeclampsia does not worsen-pregnancy continued for another week

Severe eclampsia

-Hospitalise

- Rest

- Normal diet

- **Antihypertensive therapy** – to keep diastolic BP between 90 -100 mmHg – to prevent maternal complications

- not helpful in improving perinatal outcome

- Drugs useful.

- methyl dopa

- Nifedipine
- Hydralazine

Response to treatment

- If no worsening / improvement present/no immenent eclampsia/ no fetal compromise.
- Continue pregnancy until 36w-37w under strict vigilance.
- If material condition worsens or symptoms of imminent eclampsia develop – pregnancy needs to be terminated irrespective of gestation.

Imminent eclampsia : Management of immenent eclampsia same as eclampsia.

Eclampsia:

1. General management
2. Control on convulsions
3. Control of hypertension
4. Obstetric management
5. Early detection and management of complications

General management:

- Nursed in quiet room
- Minimal handling of the patients
- Examination done under the effect of a sedative
- Vital signs monitoring, bladder catheterization, maintenance of fluid balance
- Antibiotics to prevent infection

Control of convulsions:

Various regimes have been tried

1. **Magnesium sulphate:**

Loading lose :4g of 20% $MgSO_4$ iv over 5 mins – followed by 10g of 50%

$MgSO_4$ (5g in each buttock) as a deep im injection.

If convulsions recur after 15 mins, 2 g of 50% $MgSO_4$ is given is over 5 mins.

Maintenance dose : every four hrs -5g of 50 % $MgSO_4$ deep im injection into alternate buttocks. Treatment continued for 24hrs after delivery or the last convulsions

whichever occurs later.

2. Other drugs used:

a) Lytic cocktail

b) Diazepam

c) Phenytoin

Control of hypertension:

Drugs – Hydralazine. Labetolol, Nifedipine

Obstetric management:

Decision to deliver must be taken as soon as the condition is stabilized.

- Caesarean section not necessary.

- Serious morbidity less common in puerperium in women delivered vaginally.

- Caesarean section is only done if vaginal delivery is not possible due to

some other complications such as transverse lie, cephalopelvic disproportion etc.

Chronic HT :

- Anti hypertensive therapy

- Careful monitoring of pregnancy for early detection of intrauterine growth restriction or development of preeclampsia.

- Chronic HT with superimposed preeclampsia – same as for preeclampsia.

Prognosis in hypertensive disorders complicating pregnancy:

Immediate:-

In mild cases – if diagnosed early and treated efficiently response is usually good – prognosis for mother and baby is favourable.

If severe disease and neglected – they may have convulsions and prognosis not good for both mother and fetus

Premature separation of placenta may occur adding to the dangers to mother and child.

Remote:

- vascular HT in later life – 40 %

- Recurrent preeclampsia

Differential diagnosis:

Eclampsia : Epilepsy, hysteria, cerebral tumors, other diseases which give rise to convulsions.

Chronic hypertension:

- essential familial hypertension

- arterial abnormalities such as renovasular HT, coarctation of aorta

- renal disease such as glomerulohephrits, polycystic kidney

- connective tissue disorders

New treatments :

- current data do not support the selective use of low dose asprin[2]

- Antenatal calcium supplementation do not show any benefit when given to healthy nulliparous women[3-6]

- Supplementation of women with H/O preeclampsia or abnormal uterine artery Doppler with both vitamin C and E leads to significant reduction in incidence of preeclampsia[7].

- Efficacy of heparin therapy for the prevention of preeclampsia in women with a genetic thrombophila is unknown.

Implications for fetus and newborn :

1) infants born to mothers with severe preeclampsia may show evidence of IUGR and frequently delivered prematurely. They may tolerate labour poorly and require resuscitation.

2) Medications used ante or intrapartum may affect the fetus.

a) short term sequelae of hypermagnesemia – hypotonia, respiratory depression.

b) .long term administration of $MgSO_4$ to mother – rarely associated with neonatal parathyroid abnormalities and other abnormalities of calcium homeostasis

3) Antihypertensive medications including calcium channel blockers may have fetal effects. Antihypertensive medications and magnesium sulfate generally are not contraindications to breast feeding.

4) Low dose aspirin therapy does not appear to increase the incidence of intracranial hemorrhage, asymptomatic bruising, bleeding from circumcision sites or persistent pulmonary hypertension.

5) About one third of infants born to mothers with preeclampsia have decreased platelet counts at birth but the counts generally increase rapidly to normal levels. About 40 – 50 % of newborns have neutropenia, that generally resolves before 3 days of age. These infants may be at increased risk of neonatal infection.

Key points:

1. Hypertensive disorders in pregnancy include gestational or PIH, preeclampsia, eclampsia and chronic HT with or without superimposed preeclampsia.
2. Vasospasm is a contributing factor in the pathogensis of preeclampsia and pathological changes may be seen liver, kidney and brain.
3. Eclampsia is a serious condition necessitating prompt management of convulsions and expediting delivery of fetus.
4. Magnesium sulphate has proved to the effective in controlling convulsions in eclampsia and is the preferred line of therapy.[8-12]
5. Eclampsia can be prevented if preeclampsia is diagnosed early and managed effectively

REVIEW OF LITERATURE

Lucyc chapel, et al conducted a randomized trial on the effect of antioxidants on the occurrence of pre-eclampsia in women at increased risk.

Oxidative stress has been implicated in the pathophysiology of pre-eclampsia. This randomized controlled trial investigated the effect of supplementation with vitamins C and E in women at increased risk of the disorder on plasma markers of vascular endothelial activation and placental in sufficiency and occurrence or pre-eclampsia.

In this randomized controlled trial, supplementation throughout the second half of pregnancy with vitamins C and E in women at increased risk of pre-eclampsia had significant beneficial effects on biochemical markers of the disease, and there was a significant reduction in the proportion of women with pre-eclampsia.

The doses of vitamin C and vitamin E chosen for the study resulted in significant increases in plasma concentrations of ascorbic acid and α-tocopherol. There are no reported contraindications of supplementation with vitamin C and E in pregnancy. Vitamin E is reported not to have any detrimental effects on preterm neonats or pregnant women. Numbers of

adverse perinatal outcomes were small in this study, but were similar in the two groups.

Antioxidants have been proposed as a potentially advantageous prophylactic measure for pre-eclampsia[37] Two previous studies of vitamin supplementation, both in women with established severe early-onset pre-eclampsia reported no substantial clinical benefit; Stratta and colleagues[38] used 100-300 mg/day vitamin E in a non randomized trial, and Gulmezoglu and colleagues[39] used 1000 mg/da used 1000 mg/day vitamin C, 800 IU/day vitamin E and 2000 mg/day allopurinol in a randomized controlled trial. However, Gulmezoglu and colleagues[39] reported a treatment toward later delivery in the treated group. Since later intervention may have precluded maximum benefit, both reports proposed earlier initiation of therapy.

Interpretation

Supplementation with vitamins C and E may be beneficial in the prevention of pre-eclampsia in women at increased risk of the disease. Multicentre trials are needed

to show whether vitamin supplementation affects the occurrence of pre-eclampsia in low-risk women and to confirm the results in larger groups of high-risk women from different populations.

RICHARD L. NAEYE, M.D.

Hershey, Pennsylvania

EMANUEL A. FRIEDMAN, M.D.

Boston, Massachusetts

This study determined the frequency of the individual placement and fetal disorders responsible for the excessive perinatal mortality rate associated with gestational hypertension and proteinuria. In a large prospective study of pregnancy 3.2 per cent of the mothers were classified as hypertensive when one4 or more measurements of gestational diastolic blood pressure were 85 mm. Hg or more and proteinura was 1+ or greater. The perinatal mortality rate for these pregnancies was 37.9 per 1,000 births compared with 17.2 per 1,000 for normotensive gestations without proteinuria. Forty – two per cent of the total excess perinatal mortality rate in the pregnancies complicated by hypertension was due to large placental infarcts, 15 per cent to placental growth retardation, and 13 per cent to abruption placenta. Both the frequency of occurrence and perinatal mortality rate increased for each of these disorders with increasing maternal blood pressures.

It has long been known that perinatal mortality rates increase with material hypertension and proteinuria in pregnancy.[1-3]

A. SIVERSTONE, et al study on maternal hypertension and intrauterine fetal death in mid – pregnancy

Suggested that maternal hypertension predisposes on intrauterine fetal death in the mid-trimester of pregnancy as it does in the third trimester.

Page and Christian son (1976) found that, in a series of over 14000 pregnancies, there was a direct correlation between maternal blood pressure in the mid-trimester and both the stillbirth rate and the intrauterine growth retardation rate.

E.D.M. GALLERY, et al conducted a study on predicting the development of pregnancy – associated hypertension the place of standardized blood-pressure measurement.

While this is by no means an absolutely certain method of distinguishing patients who will become hypertensive in late pregnancy, it demonstrates that an at-

risk group can be detected in early pregnancy, and these patients could then be scrutinized more closely throughout pregnancy.

C.W.G. REDMAN, et al conducted a study on fetal outcome in trial of antihypertensive treatment in pregnancy.

Active treatment was associated with a significantly improved fetal outcome, due in part to a reduced number of mid-pregnancy abortions.

Hypertensive treatment had no effect on fetal growth in utero. The better outcome associated with treatment was not due to the prevention of pre-eclampsia, and may be party due to a direct or indirect effect of methyldopa on uterine activity. Methyldopa is safe to use for the treatment of hypertension in pregnancy in the context of the medical and obstetric supervision.

D.R. HALL, et al conducted case serious study to determine whether prophylactic magnesium sulphate is necessary to prevent eclampsia and associated complications among women with pre-eclampsia prior to labour.

Eclampsia remains a complex and partially understood disease. Currently prophylaxis I the area of greatest controversy. Although magnesium sulphate is a proven anticonvulsant in the management of eclampsia its role in prophylaxis remains to be determined. In our study of high risk patients in whom blood pressure control was carefully applied but magnesium sulphate not given, the rate of eclampsia was low and eclampsia did not appear to worsen the prognosis for mother or fetus.

E.J. COETZEE, et al conducted a randomized controlled trial of intravenous magnesium sulphate versus placebo in the management of women with severe pre – eclampsia.

Conclusion: The use of intravenous magnesium sulphate in the management of women with severe pre-eclampsia significantly reduced the development of eclampsia.

Evidence was based on large descriptive studies such as those of Pritchard and the small controlled studies comparing magnesium sulphate to phenytoin or diazepam.

Sibai advocated the use of magnesium sulphate even in cases of moderate pre-eclampsia, while Redman maintained that anti-convulsants were only indicated if eclampsia occurred.

Lucas et al conducted a prospective study comparing magnesium sulphate to phenytoin in the prevention eclampsia.

In their study no woman receiving magnesium sulphate developed eclampsia while 10 women randomized to the phenytoin group hand convulsions (P=0.0004)

This study show that intravenously administered magnesium sulphate in the dosage used is effective in reducing the incidence of eclampsia in women with severe pre-eclampsia. However, the routine use of magnesium sulphate in all cases of pre-eclampsi is not justified.

RICHARD J. LEVINE, et al conducted a study on trial of calcium to prevent preeclampsia.

In summary, supplementation with 2 g of calcium per day did not reduce the incidence of preeclampsia, pregnancy-associated hypertension, or important maternal and perinatal complications of pregnancy in nulliparous women. Moreover, supplementation did not appear to prevent adverse pregnancy out-comes in adolescents or in women with low baseline dietary calcium intakes or urinary calcium excretion. The results do not support the use of calcium supplementation to prevent preeclampsia in healthy nulliparous women.

STEVE CARITIS, M.D., conducted a study on low dose aspirin to prevent preeclampsia in woman at high risk.

Low-dose aspirin did not prevent preeclampsia in pregnancy women at risk for the disease.

However, aspirin did not effect the mothers or neonates adversely.

JUSTIFICATION OF THE STUDY

- Hypertensive complicating pregnancies have a greatest negative impact on fetal and newborn outcome.
- Incidence of morbidity and mortality in fetus and newborn has come down due to effective implementation of national health programmes.
- Government has implemented first referral unit for antenatal, natal and postnatal and neonatal care which may have a positive impact on the fetal and newborn outcome.
- Government has recently introduced comprehensive emergency obstetric and newborn care centre(CEMONC) at Taluk headquarters, district headquarters and medical colleges to give a health care for pregnant mother and children.
- More recently Government is implementing integrated management of newborn and childhood illnesses (IMNCI) care for newborn and children.
- Increasing media awareness, increasing literacy into among general population and increasing socioeconomic status of the

people has created health awareness among people and also lot of changes has taken place in political and socioeconomic front.

- These all factors are reducing the morbidity and mortality in newborn.
- Most of the studies in the field of fetal outcome in hypertensive complicating pregnancies, in India, have been done very rarely .
- In this background, it is decided to study the fetal outcome in mothers with hypertensive disorders complicating pregnancy.

AIM OF THE STUDY

To assess the fetal outcome in mothers with hypertensive disorders complicating pregnancy.

MATERIAL AND METHODS

Study design Case - control study

Study Place This study was conducted in the Department of Obstetrics and Gynaecology and Department of paediatrics, Government Raja Mirasdar Hospita, Thanajvur attached to Thanjavur Medical College, Thanjavur.

Study Period August 2005 to July 2006

Study Population

Inclusion Criteria

- Pregnant mothers with hypertensive complicating disordors for "case group study"
- Pregnant mothers with no hypertensive complicating disorders for "control group" study

Exclusion criteria

- Pregnant mothers who did not turn up for follow up
- Pregnant mothers who were not delivered during the study period

STUDY MANOEUVRE

Pregnant mothers attending the outpatient department and got admitted in Department of Obstetrics and Gynaecology were given a preformed questionairre and it was explained to them and prior consent got to proceed with the study. The mothers were questioned regarding parity, prior history of any associated illnesses and prior hypertensive disorders complicating pregnancy. They were examined regarding age, height, weight, associated symptoms and signs, and blood pressure recorded. Pregnant mothers with hypertension were taken for case study and pregnant mothers with mo hypertension were taken for control group of study. The mode of treatment with anti-hypertensives and the method of delivery were noted. They were followed till puerperium. The babies born to them were examined and documented.

The results were analysed using z test or Normal test and x^2-test. (Annexure-1)

OBSERVATIONS

The study was conducted among mothers with hypertensive disorders of pregnancy and for case comparison control group selected with mothers haring no hypertensive disorders of pregnancy. In this study there were 628 cases and 658 controls

CHART-2

DATA

	PIH Cases	Control Group
Pregnant Mothers	628	658
Twin Pregnancies	17	2
Triplets	1	-
Births	647	660
Live Births	530	615
Dead Born	117	45
Mother Expired	5	-
Newborn Death	20	17

CHART - 3

AGEWISE DISTRIBUTION OF STUDY POPULATION

AGE	<20 years (%)	20-35 years (%)	>35 years (%)	Total (%)
CASES	24 (3.4)	595 (94.8)	9 (1.4)	628 (100)
CONTROL GROUP	25 (3.8)	627 (95.3)	6 (0.9)	658 (100)
Total				1286

595 (94.8%) Cases were in between 20-35 years, 24(3.4%) Cases were less than 20 years, and 9 (1.4%) Cases were above 35 years. Among controls – 627 mothers (95.3%) were in between 20-35 years, 25 (3.8%) mothers were less than 20 years and 6 (0.9%) were more than 35 years (Table – 2)

CHART -4

TYPE OF DIAGNOSIS OF CASES

PARITY	New (%)	Recurrent (%)	Chronic HT with superimposed P IH (%)	Total
Primi	374 (59.6)	-	-	374 (59.6)
Multi	219 (34.9)	26 (4.1)	9 (1.4)	254 (40.4)
Total	593 (94.5)	26 (4.1)	9 (1.4)	628 (100)

The primigravida and multigravida group of case group was analysed depending upon occurrence of hypertensive complicating pregnancies of the total of 628 cases.

- There were 374 (59.6%) cases in primigravida group that was newly diagnosed.
- There were 219 (34.9%) new cases, 26 (4.1%) recurrent cases, and 9 (1.4%) chronic hypertension with superimposed PIH cases in the multigravida group.
- There was no chronic hypertension with superimposed PIH cases in the primigravida group.

CHART - 5

MONTH OF DIAGNOSIS OF CASES

MONTH	NEW	RECURRENT	CHRONIC HT WITH Superimposed PIH	Total
3	-	-	1	1
4	-	-	4	4
5	1	1	-	2
6	18	1	-	19
7	33	2	-	35
8	27	7	-	94
9	87	13	-	452
10	439	2	-	17
Others	-	-	4	4
Total	593	26	9	628

Hypertensive complicating pregnancies were analyzed depending upon the time of diagnosis of the cases into newly diagnosed at the present pregnancy, recurrent hypertensive complicating pregnancies with the time of diagnosis at the present pregnancy and chronic hypertension with superimposed PIH.

This study was statistically analyzed where

CHART - 6

MONTH OF DIAGNOSIS OF CASES AND THEIR FETAL OUTCOME

	≤ 7 m	>7m	P value	≤ 7 m	>7m	P value
	LB (%)	LB (%)	< 0.05	DB	DB	< 0.05
CASES	29 (46.8)	501 (85.6)		33 (53.2)	84 (14.4)	

Fetal outcome was analysed in PIH cases between before third trimester diagnosed mothers and mothers diagnosed during third trimester.

This was statistically analysed.

Livebirths between less than or equal to 7 months of diagnosis and more than 7 months of diagnosis of cases are highly significant ($P < 0.05$)

There is a significant difference in deadborn babies between ≤ 7 months and > 7 months of diagnosis of cases ($P<0.05$)

CHART - 7

TYPE OF DIAGONSIS IN RELATION TO CASE SEVERITY

	Mild	Severe	APE	IPE
Primi	239	95	36	4
Multi				
New	141	57	21	0
Recurrent	14	12	0	0
Chronic	7	2	0	0

In primigravida all are new cases whereas in multigravida there were new cases, recurrent cases and chronic HT with superimposed PIH. There were no chronic HT with superimposed PIH.

CHART - 8

GRAVIDA ASSESSMENT IN STUDY POPULATION

	PIH		CONTROL	
	Cases	%	Cases	%
Primi	374	59.6	314	47.7
G_2	129	20.5	238	36.1
G_3	91	14.5	83	12.6
G_4	26	4.1	17	2.6
G_5	6	1	5	0.8
G_6 & above	2	0.3	1	0.2

Case group and control group were analysed depending upon the gravida into primigravid, G_2, G_3, G_4, G_5, G_6 and above groups.

There were 374 cases (59.6%) in case group and 314 mothers (47.7%) in control group. Secondgravida was 129 (20.5%) in PIH group whereas 238 (36.1%) mothers in control group 91 (14.5%) cases and 83 (12.6%) mothers in controls were third gravida. 26 (4.1%) cases and 17 (2.6%) controls were in the fourth gravida. 6 cases (!%) and 5 (0.8%) controls were in the fifth gravida. Sixth and above gravida were (2 0.3%) in cases and 1 (0.2%) in controls.

CHART - 9

FETAL OUTCOME IN RELATION TO GRAVIDA

Cases	Primi		G_2		G_3		G_4 & above		Total	
	LB	DB	LB	DB	LB	DB	LB	DB	LB	DB
PIH	330	56	106	25	70	26	24	10	530	117
Control	297	20	228	14	72	6	18	5	615	45
Total										

In this study, outcome of babies were analysed between different gravidas. Gravidas are divided into primigravida, G_3, G_3 and $\geq$ G_4 group.

CHART - 10

SEVERITY OF CASE GROUP

Category	Numbers	%
Mild	401	63.1
Severe	166	26.4
APE	57	9.1
IPE	4	0.6
Total	628	100

Hypertensive complicating pregnancy group were segregated depending upon the severity into mild, severe, APE, and IPE cases. There were 401 mild cases (63.1%), severe group was 166 (26.4%), APE 57 (9.1%), cases and IPE 4 cases (0.6%).

CHART - 11

SEVERITY OF CASE GROUP IN RELATION TO GRAVIDA

PIH	Primi	Multi	P value
Mild	239	162	> 0.05
Severe	95	71	> 0.05
APE	36	21	> 0.05
IPE	4	-	

Severity of PIH cases occurring during primigravida and multigravida was compared.

Between mild groups there is no significant difference ($P > 0.05$)

There is insignificant difference between the severe cases

($P > 0.05$)

There is no significant difference between the APE cases

($P > 0.05$)

$\chi^2 = 0.4937$

χ^2 with 2 d.f. at 0.05 level = 5.991 There is no significant association between PIH and its severity.

CHART - 12

FETAL OUT COME OF CASES IN RELATION TO SEVERITY

	LB	DB
Mild	376	39
Severe	126	44
P valve	< 0.05	>0.05
APE	31	26
IPE	3	2

The case group was segregated depending upon the severity of the hypertensive complicating pregnancies into mild, severe, APE and IPE cases and the fetal outcome was analysed.

Life birth between mild group and severe group are highly significant (P < 0.0.5)

There is no significant difference between mild and severe cases in relation to dead born babies (P > 0.05)

CHART – 13

FETAL OUT COME IN STUDY POPULATION

ASSOCIATED WITH RISK FACTORS

	LB (%)	DB (%)
PIH	132 (80.5)	32 (19.5)
Control	79 (94.1)	5 (5.9)
P Value	< 0.05	< 0.05

NOT ASSOCIATED WITH RISK FACTORS

	LB (%)	DB (%)
PIH	398 (82.4)	85 (17.6)
Control	536 (93.1)	40 (6.9)

Cases and controls were analysed between live births and dead births depending upon presence or absence of risk factors.

Out of 164 births in mothers with PIH associated with other risk factors, there were 132 (80.5%) were live births and 32 (19.5%) were dead born. Out of 84 births in control group associated with risk factors there were 79 (94.1%) live births and 5 (5.9%) dead born.

When not associated with other risk factors compared, there were 398 (82.4%) live births and 85 (17.6%) dead born in case group whereas in controls out of 576 births, 536 (93.1%) were born alive and 40 (6.9%) were born dead.

There is a significant difference in livebirth and dead born babies on comparing between cases and controls with associated illness.

CHART -14 ASSOCIATED ILLNESS AND ITS OUTCOME IN STUDY POPULATION

RISK FACTORS	PIH			CONTROL		
	LB	DB	Total	LB	DB	Total
Age (<20 >35)	27	7	33	29	2	31
Elderly primi ≥ 30yr	22	2	21	13	3	16
Multiple Pregnancy	33	4	18	4	-	2
Anemia	37	5	36	4	2	6
Abnormal Presentation	18	4	22	9	2	11
Hydramnios	8	2	10	8	1	9
Chroni sys illness	2	2	4	-	-	-
APH	10	10	20	1	-	1
Short stature	3	-	3	3	-	3
Heart disease	2	-	1	3	1	4
HIV + ve	-	-	-	2	-	2

The case group and control group were analysed depending upon other associated risk factors and their impact on fetal outcome. The risk factors taken into account were age group < 20 yrs and more 35 yrs, primigravida with 30 yrs and above, multiple pregnancies (like twins, triplets), anemia, abnormal presentation like breech, persistent occipito posterior

oligohydramnios and polyhydramnios, chronic systemic heart diseases (like rheumatic heart disease, dilated cardiomyopathy) and mothers with HIV positive cases.

There is a significant difference in live born babies between case and control groups ($P< 0.05$)

There is a significant difference in dead born babies between case and control group.

CHART - 15

DRUGS RECEIVED IN CASE POPULATION

Type of PIH	Aldo	Aldo./ Nife	Aldo / Nife / $MgSO_4$	Others	Total
MILD	224	118	2	57	401
SEVERE	24	110	15	17	166
APE	7	9	34	7	57
IPE	-	1	-	3	4
TOTAL	225	238	51	84	628

Cases were separated into mild, severe, APE and IPE cases. There were no PPE cases. They were analysed depending upon the treatment they received as aldo group, aldo +Nife group, aldo + nife + $MgSO_4$ and treated with other modes of drugs.

Of 401 mild cases, 284 cases were treated with aldo alone, 118 cases with aldo +Nife, 2 cases with aldo +nife+ $MgSO_4$, and 57 cases were treated with other mode of treatment.

Of 166 severe cases, 24 were treated with aldo alone, 110 were treated with aldo+nife, 15 cases were treated with aldo+nife+ $MgSO_4$ and 17 cases were treated with other modes of treatment.

Of APE cases, 7 were treated with aldo alone, 9 were treated with aldo+nife, 34 were treated with aldo+nife++$MgSO_4$ and 7 were treated with other modes of treatment.

Of 4 IPE cases, 1 was treated with aldo+nife whereas 3 were treated with other modes of treatment.

CHART – 16

FETAL OUTCOME IN RELATION TO DRUGS RECEIVED IN CASE POPULATION

	Aldo		Aldo/Nife		Aldo / nife / + $MgSO_4$		others	
	LB	DB	LB	DB	LB	DB	LB	DB
Mild	213	23	108	11	3	0	52	5
Severe	17	6	87	28	11	6	11	4
APE	6	1	5	4	13	21	7	0
IPE	0	0	1	1	0	0	2	1

The fetal outcome was assessed depending upon the treatment received in various types of PIH. They were separated into aldo only, aldo+nife, aldo+nife+ $MgSO_4$ and other modes of treatment and the livebirths and deadborn noted.

CHART - 17

FETAL OUTCOME IN RELATION TO TYPE OF DELIVERY IN STUDY POPULATION

	LN	LSCS	'P' value	LN	LSCS	'P' value
	LB	LB		DB	DB	
PIH	361	169	<0.05	98	13	>0.05
Control	483	132	<0.05	45	-	<0.05

The case group and control group were analysed depending the method of delivery and its effect on fetal outcome statistically analysed.

There is a significant difference in LN and LSCS in live-birth babies both in PIH group and control group (p value for both < 0.05)

There is no significant difference between LN and LSCS method of delivery in dead-born babies in PIH cases (p>0.05) whereas there is a significant difference between LN and LSCS method of delivery in dead-born babies control group (p<0.05)

CHART - 18

FETAL OUTCOME WITH MATURITY IN STUDY POPULATION

Maturity	Preterm						P value < 0.05 'P' value	Term						P value < 0.05 'P' value	Postterm						Others	
Gestational Age	SGA		AGA		LGA			SGA		AGA		LGA			SGA		AGA		LGA			
Outcome	LB	DB	LB	DB	LB	DB		LB	DB	LB	DB	LB	DB		LB	DB	LB	DB	LB	DB	LB	DB
PIH Cases	44	42	47	24	13	1		100	17	302	9	21	0		1	5	2	3	0	0	0	16
Control group	1	2	10	5	0	0		69	5	518	6	17	0		0	0	0	0	0	0	0	27

Maturity with gestational age of babies born to case group of mothers and control group of mothers was analysed. Highly significant difference of preterm babies born to mothers with PIH and with no PIH – p value is < 0.05. There is highly significant difference of term babies between case and control groups.

The observations are made with regard to age distribution, chronicity of PIH, severity of PIH in relation to chronicity, impact of diagnosis before or during third trimester on fetal outcome, occurance of PIH cases with regard to gravida and its relation with fetal outcome, severity of PIH in relation to gravida, severity of PIH and its relation to outcome of babies, associated illnesses and risk factors and its effect on fetal outcome, treatment of various types of PIH cases with various drugs, and its effect on fetal outcome, the method of delivery and its impact on fetal outcome, the methods of delivery and its impact on fetal outcome, outcome of babies with regard to severity of the PIH, and maturity of the babies born to PIH mothers.

The case group was compared with control group in relation to age distribution, gravida, and its outcome, associated illness and its outcome, method of delivery and its impact on fetal outcome and outcome of babies with regard to maturity of the babies.

Statistical analysis was made using z test or normal test and x^2 test. Results are highly significant when new cases are compared with recurrent cases, outcome of live birth between mild PIH group and severe PIH group,

live birth of babies of PIH mothers in relation to type of delivery live birth and dead born of control group in relation to type of delivery, preterm babies in relation to PIH and control group and term babies in relation to PIH and control group.

Statistically the following analysis were of no significance.

1) Outcome of dead born babies in PIH mothers in relation to type of delivery.
2) No significant or insignificant in relation to primigravida or multigravida between mild group, severe group and APE group.
3) No significant in relation severity of PIH mild and severe group with dead born babies.
4) No significant association between PIH severity and gravida.

VARIOUS ANALYSES ARE MADE BY Z TEST (OR) NORMAL TEST AND χ^2– test

Z – Test (or) Normal test

Test of Significance for difference between proportions

$$H_0 : \rho_1 = \rho_2$$

$$Z = \frac{\rho_1 = \rho_2}{\sqrt{P\,Q\,(1/n_1 + 1/n_2)}} \sim N(0,1)$$

Where $\rho_1 = x_1/n_1$, $\rho_2 = x_1/n_1$, $P = \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2}$

χ^2– test

H_0 : The two attributes are independent.

$$\chi^2 = \sum_{i=1}^{m} \sum_{j=1}^{n} \frac{(O_{ij} - E_{ij})^2}{E_{ij}} \sim \chi^2_{(m-1)(n-1)\ d.f}$$

where $E_{ij} = \frac{m_i \times n_j}{N}$

DISCUSSION

Maternal well-being, freedom from nutritional and systemic in-utero environment for proper growth and development of fetus.Hypertensive complicating disorders of pregnancy are one of those conditions which may jeopardize not only the maternal health life but also fetal well-being. It forms one of the deadly triad along with hemorrhage and infection.

This study was conducted among 628 mothers who had hypertensive recorders complicating pregnancy and compared with 660 mothers who did not have hypertensive disorders complicating pregnancy.The fetal outcome was assessed between the two groups.

In case group, there were 530 livebirths (81.9%) out of 647 births, whereas in control group there were 615 livebirths(93.2%) out of 660 births. The percentage of deadborn babies in case group was (18.1%) whereas in control group it was only 6.8%. Moreover there were 5 maternal deaths in case group with no deaths in control

group. These data indicate that both maternal and fetal mortality were higher in case group showing the significance of the hypertensive disorders complicating pregnancy in maternal and fetal outcome. (Refer chart 2).

In this study, maximum number of mothers were in the age group between 20-35 years and there is no significant change between case group(94.8%) and control group(95.3%) in this age group. This may be due to predominant incidence of pregnancies in this age group(Refer chart 3)

Maximum number of PIH mothers were newly diagnosed (94.5%) ie 593 cases out of 628 cases, but still recurrent PIH case group were present 26(4.1%). This suggests lack of awareness in diagnosing PIH cases. There were only 9 cases (1.4%) of chronic HT with superimposed PIH and there were no gestational induced hypertension cases. This implicates the importance of following of gestation induced hypertension cases and chronic hypertension cases which leads to superimposed preeclampsia cases(Refer chart 4)

Among the PIH group comparing the month of diagnosis, most of the mothers were diagnosed in third trimester only both in new cases 541(91.2%) out of 593 cases and in recurrent PIH cases 22(84.6%) out of 26

cases. This further confirms the need of awareness in diagnosing the PIH cases(refer chart 5)

There is a significant increase in dead-born babies 33(53.2%) out of 62 births in PIH mothers diagnosed before third trimester, whereas live-births were more in the PIH mothers diagnosed after 7 months of amenorrhea 501(85.6%) out of 585 births in this group. This suggests that more number of months between diagnosis and delivery leads to greater negative impact on fetal outcome. This may be due to the effect of the hypertensive disorder in producing various deleterious effects on placenta and fetus-showing more period of exposure leads to more deleterious effect (refer chart 6)

Mild PIH cases were more when mothers are newly diagnosed (primigravida-new 239(63.9%) out of 374 cases in the primigravida group; multigravida-new 141(64.4%) out of 219 multigravida new cases) whereas severe PIH cases were more

in recurrent PIH mother 12(46.1%) in relation to mild cases 14(53.9%), suggesting the increased severity of the disorder in recurrent PIH group (Refer chart 7)

Occurrence of PIH cases were more in primigravida mothers 374(59.6%) out of 628 cases whereas there were only 254 cases(40.4%) in all other gravidas totaled. Moreover, when both primigravida and second gravida were added there were 503 cases(80.1%) in PIH gravida group. This may suggest the increased occurrence of PIH cases in the initial pregnancies but when it was compared with control group primigravida mother were 314(47.7%) and second gravida were 238(36.1%) totaling (83.8%) which is almost equal to PIH case group(80.1%). This suggestion may be noted when assessing the increased risk of PIH cases in nulliparous women. (Refer.chart- 8)

Out of 386 births in PIH mothers with primigravida the dead-born were 56(14.5%) whereas in control group the dead-born were 20 (6.3%). The dead-born babies in second gravida were 25(19.1%) whereas in control group the dead-born

were 14(5.8%). In third gravida, the deadborn babies in PIH were 26(27.1%) whereas in control group, the deadborn in PIH group were 10(29.4%) and in control group the deadborn were 5(21.7%). These data show that the

deadborn babies were significantly higher in PIH group compared to control group. (refer chart 9)

When comparing between primigravida and multigravida mild cases were 239(59.6%) in primigravida, severe cases were 95(57.2%) in primigravida, severe cases were 95(57.2%) in primigravida antepartal eclampsia cases were 36(63.1%) in

primigravida intrapartal eclampsia cases were 4(100%) in primigravida. This data shows there is no significant difference between primigravida and multigravida. In

mild, severe and antepartal eclampsia cases. The p values were >0.05 in all these groups (refer chart 10)

One of 628 cases, mild cases were more in number 401(63.1%) and severe cases were 166(26.4%). The antepartal and intrapartal eclampsia cases totally were 61(9.7%). This shows preeclampsia cases are more common than eclampsia cases (refer chart 11)

Comparing the outcome of babies, dead-born babies were more common in severe preeclampsia 44(25.9%) antepartal eclampsia 26(45.6%)

and in intrapartal eclampsia 2(66.7%) whereas in mild preeclampsia cases the deadborn were 39(9.4%). This shows that with increasing seventy of the PIH cases, the dead-born babies were more in number. (refer chart 12)

There is little increase in dead-born babies when there are other associated risk factors as dead-born babies in PIH mothers with associated risk factors were 32(19.5%) whereas PIH without other risk factors they were 85(17.6%) (refer chart 13)

When mild cases were treated with alpha methyl dopa only the dead-born babies were 23(9.7%) whereas treatment with aldo+nifedipine showed 11(9.2%)

showing no difference between treating the mild cases with alpha methyl dopa only or alpha methyl dopa and nifedipine.

When severe cases were treated with alpha methyl dopa only the deadborn were 6(26%) while treatment with alpha methyl dopa +nifedipine the deadborn were 28(24.3%) and treatment with aldo+nife+$MgSO_4$ the deadborn were 6(35.2%). This also shows that there is no significant variance between treating the severe cases with alpha methyl dopa only, or alpha methyl dopa +nifedipine or alpha methyl dopa +nifedipine +$MgSO_4$.

The deadborn rate is relatively higher in antepartal eclampsia and intrapartal eclampsia while treating with alpha methyl dopa +nifedipine and alpha methyl dopa +nifedipine +$MgSO_4$ as in antepartal mothers the cases treated with alpha methyl dopa only had one deadborn (14.2%), treating with alpha methyl dopa +nifedipine the deadborn were 4(44.4%) and treating with alpha methyl dopa +nifedipine +$MgSO_4$ the deadborn were 21(61.7%). In intrapartal eclampsia, on treatment with alpha methyl dopa +nifedipine the deadborn cases was 1(50%). These datas show that

the fetal outcome may not be dependent upon the mode of treatment. This may be due to the severity of the disease.

Livebirths were 361(68.1%) in cases and 483(78.5%) in control group when delivered via naturalis. When delivered via naturalis the deadborn babies were 98(88.3%) . In cases group whereas in control group all deadborn babies 45(100%) were delivered via naturalis.

This data shows that type of delivery does not have much impact on positive as well as negative fetal outcome.(refer table 17)

Out of 631 babies of cases group population whose gestational age and maturity were analysed, 171(27.1%) were delivered preterm, and 117

(18.5%)babies were delivered as term- small for gestational age, totaling 288(45.6%). Out of 633 babies of control group, 18(2.8%) were delivered preterm, 74(11.7%) babies were delivered as term small for gestational age. This show the greater negative impact on fetal outcome in case group compared with control group.

524(82.8%) babies were born as term appropriate for gestational age in control group whereas 311(49.3%) babies were born as tern appropriate for age in case group. This also shows the negative impact on fetal outcome in case group compared with control group.

CONCLUSION

From the study, the following conclusions were made out.

- Both maternal and fetal mortality were higher in hypertensive disorders complicating pregnancy.

- Follow up of gestational induced hypertension cases and chronic hypertension cases is needed to detect superimposed preeclampsia.

- Diagnosis of both newly diagnosed and recurrent cases occurs only in third trimester which has a greater negative impact on fetal outcome.

- There is increased severity of the disorder in recurrent hypertensive disorders complicating pregnancy.

- There is no difference of severity of hypertensive disorders complicating pregnancy between primigravida.

- With increasing severity of the hypertensive disorders complicating pregnancy the dead born babies were more in number.

- The type of delivery does not have much impact both on positive as well as negative fetal outcome.

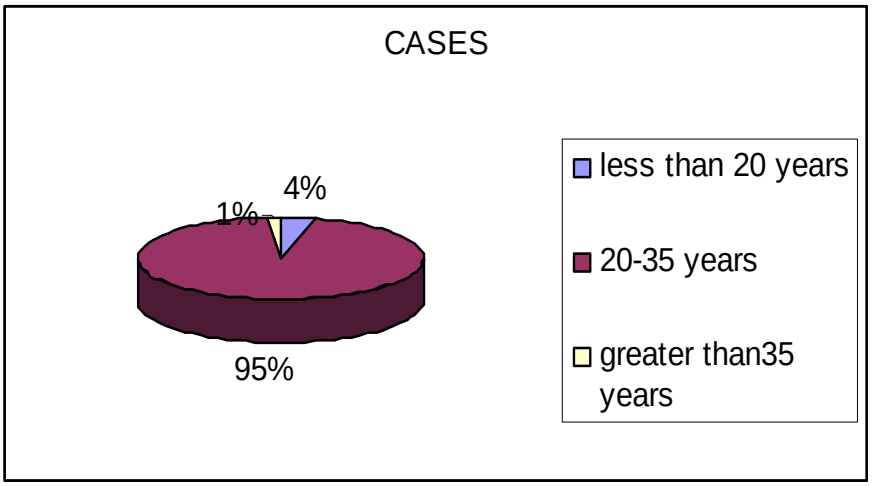
- Preterm babies and term SGA were more in the case group which will have greater negative impact in the future wellbeing of the baby.

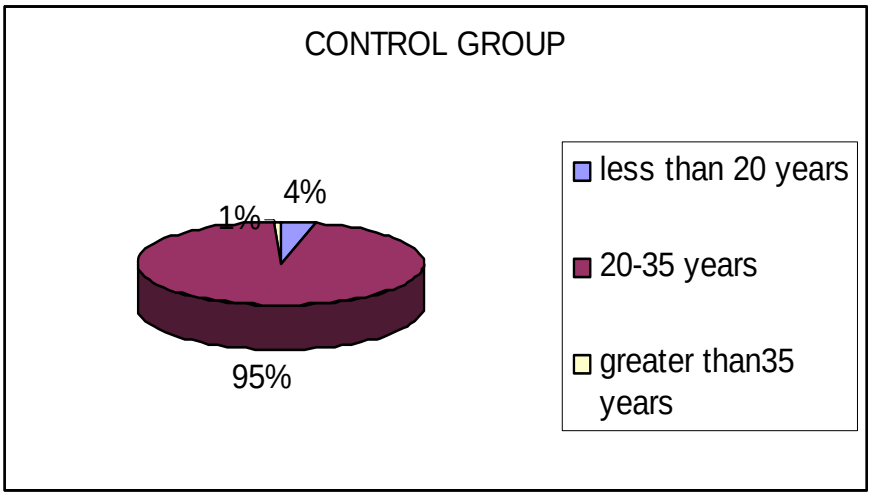
- It has to be kept in mind that recurrent PIH still occurs.

- Earlier diagnosis of the hypertensive disorders complicating pregnancy prevent the negative impact on fetal wellbeing which stresses the need of identification of cases not only by doctors but also other field health functionaries.

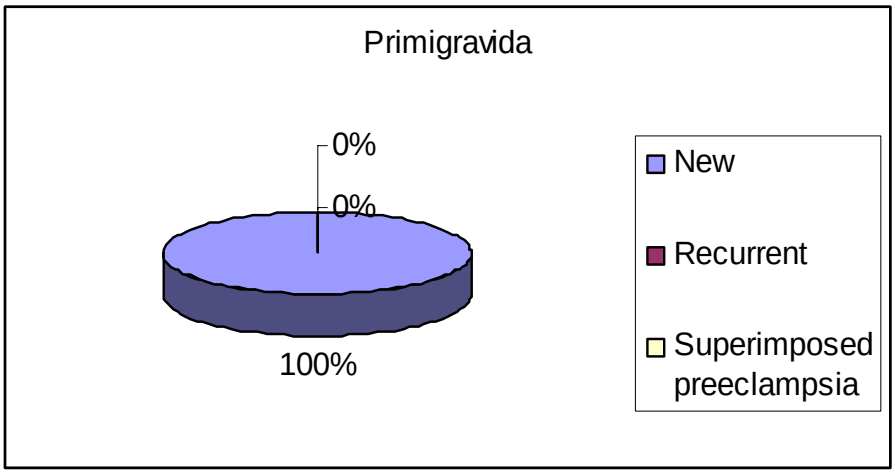
- PIH training unit can be established at every medical college like diarrhea treatment cum training unit for diarrhea and periodic continuing medical education on PIH can be conducted for field heath functionaries and doctors working in primary and secondary level institutions. This will go in a long way to improve the fetal out come

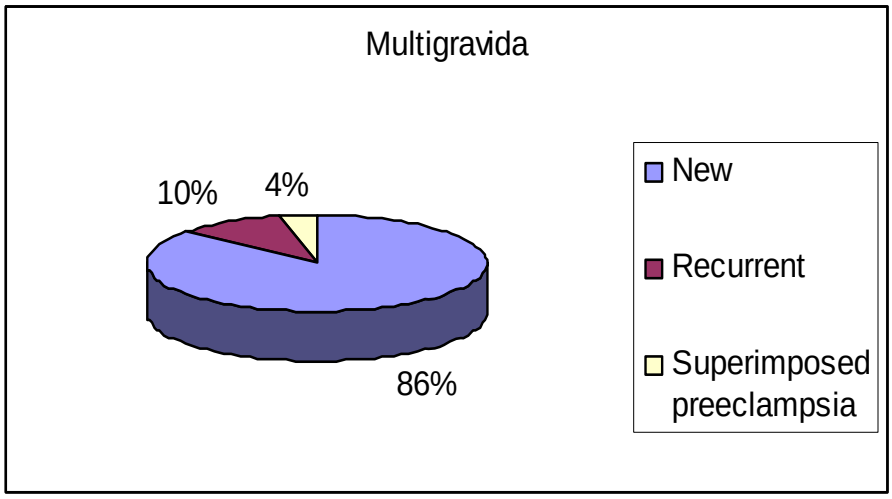
AGE DISTRIBUTION OF STUDY POPULATION



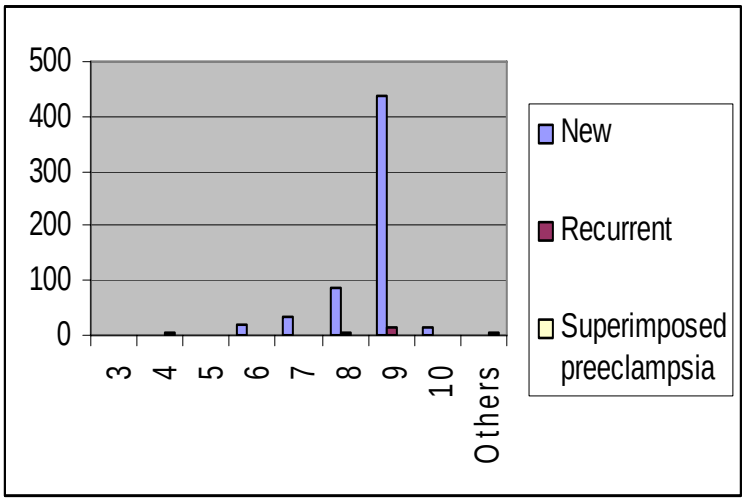


TYPE OF DIAGNOSIS OF CASES

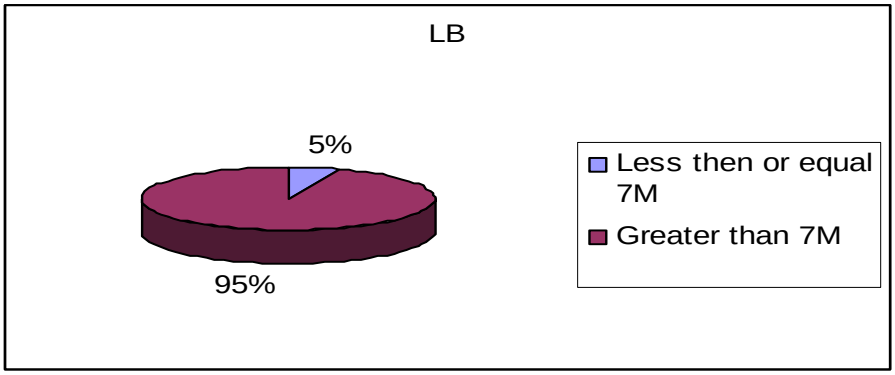


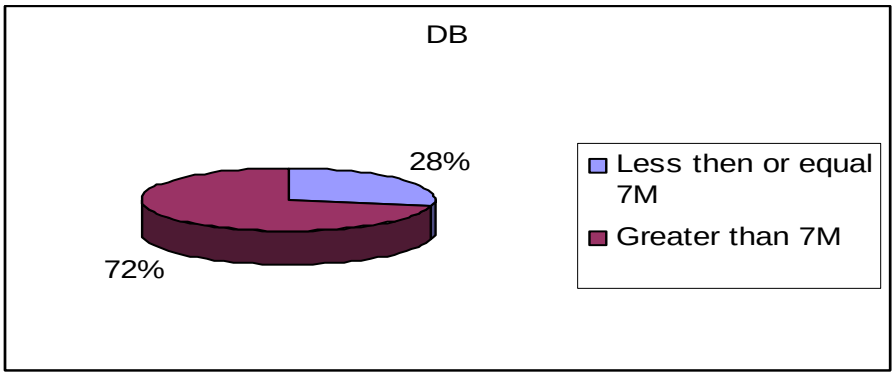


MONTH OF DIAGNOSIS OF CASES

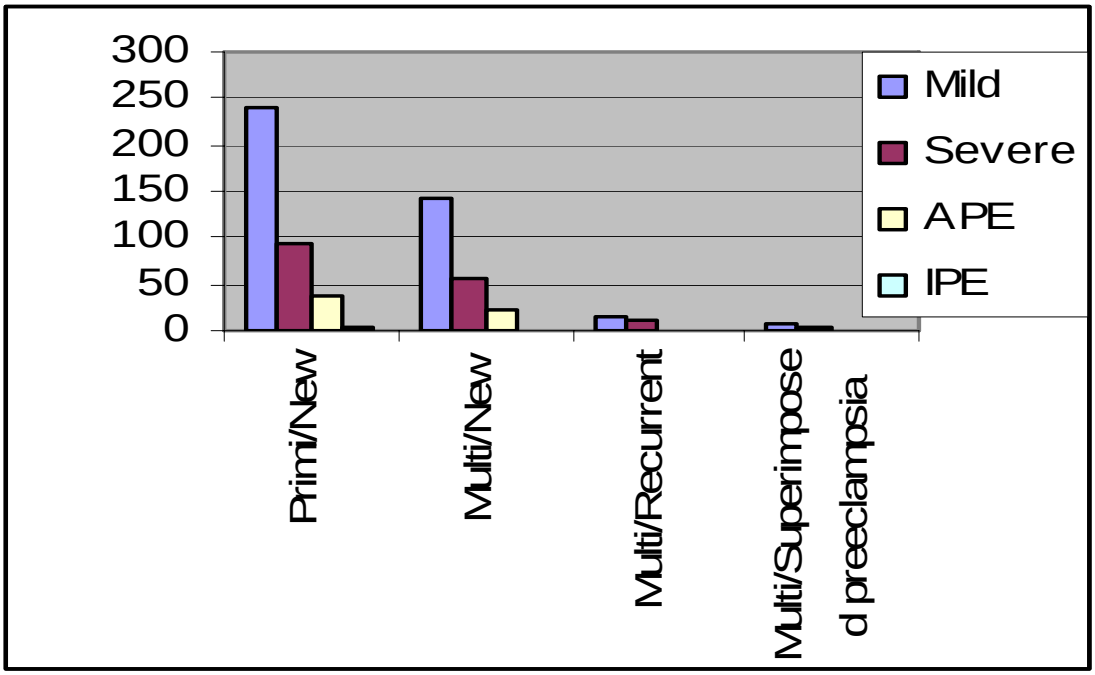


MONTH OF DIAGNOSIS OF CASES AND THEIR FETAL OUTCOME

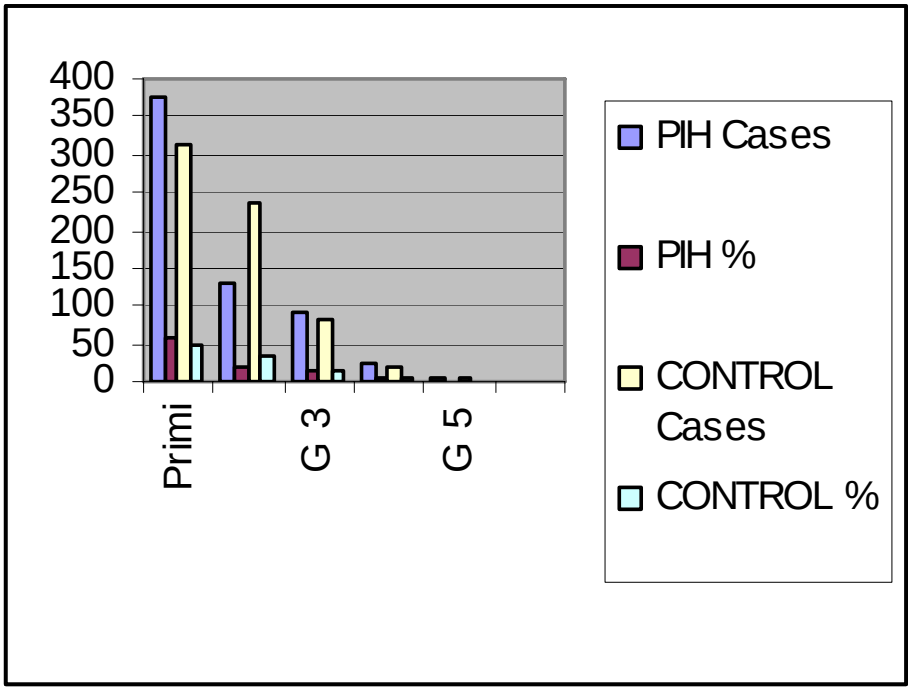




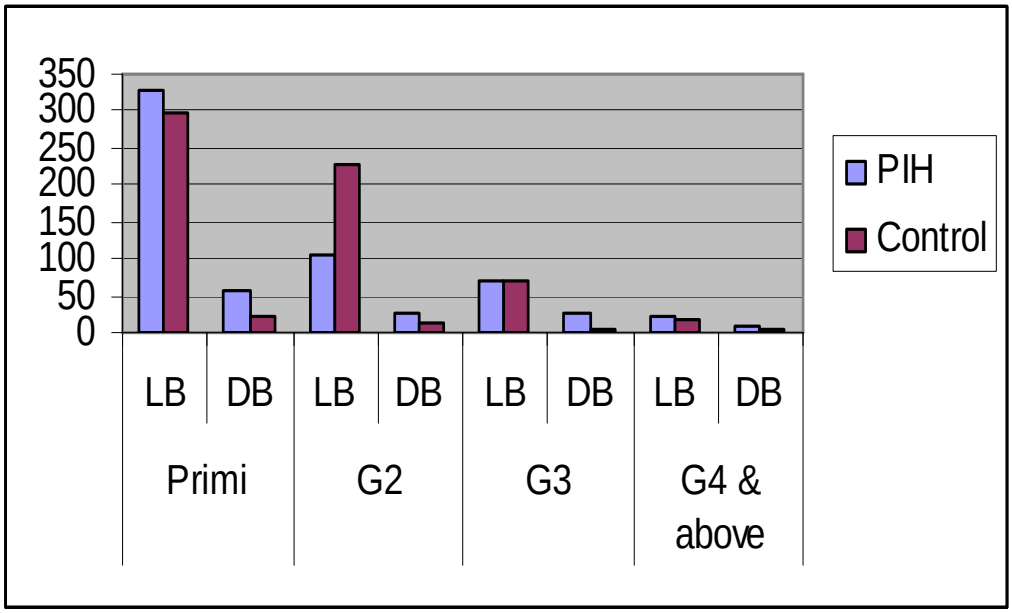
TYPE OF DIAGNOSIS
IN RELATION TO CASE SEVERITY



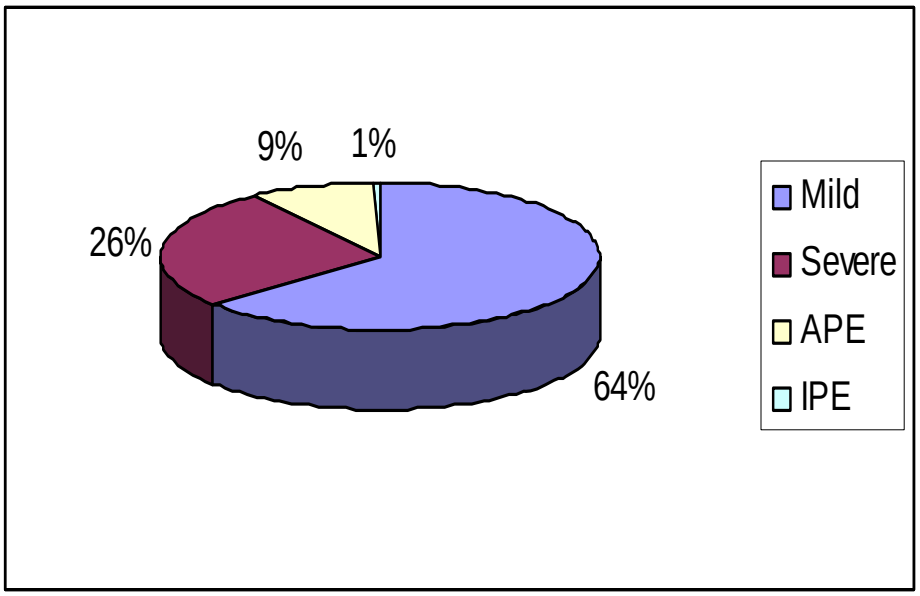
GRAVIDA ASSESSMENT IN STUDY POPULATION



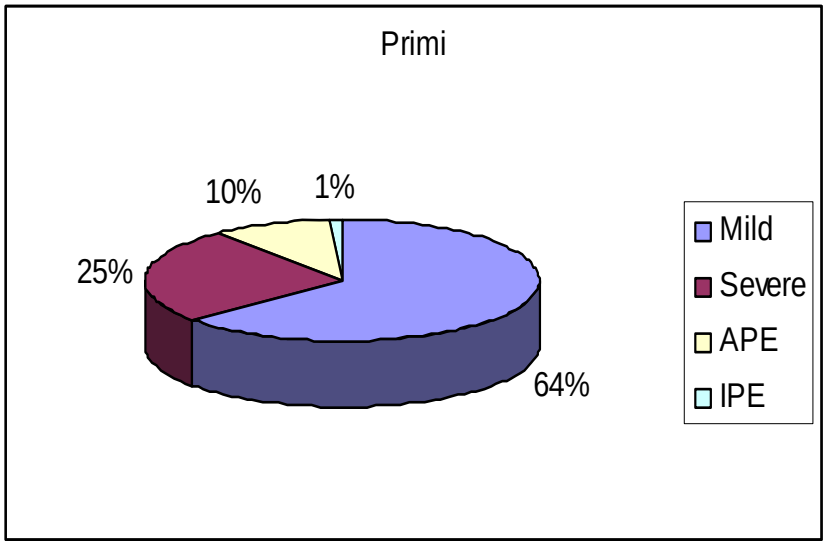
FETAL OUTCOME IN RELATION TO GRAVIDA

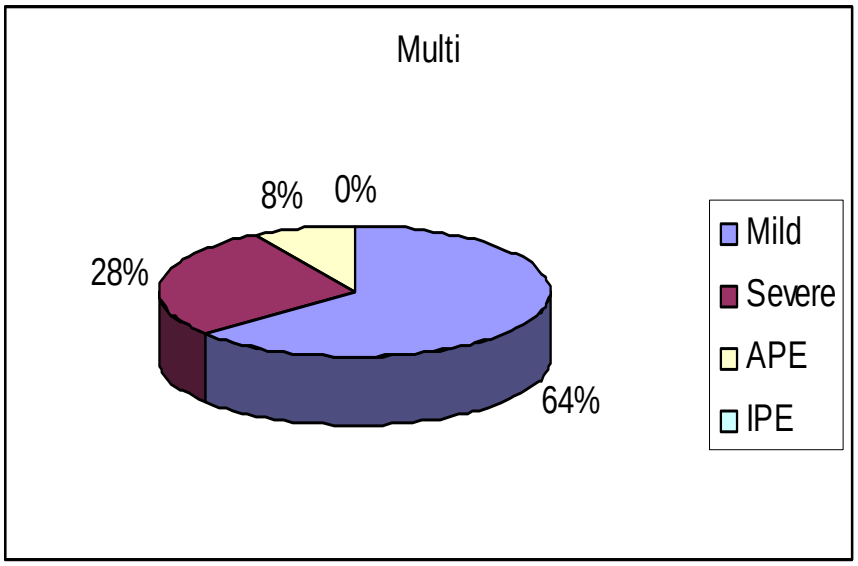


SEVERITY OF CASE GROUP

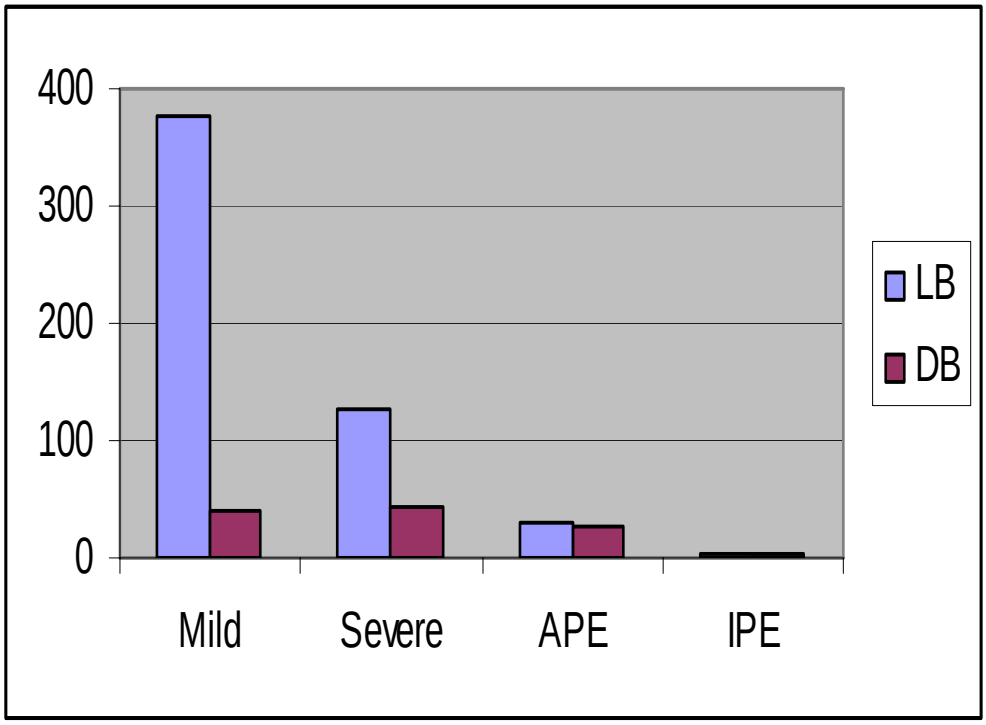


SEVERITY OF CASE GROUP IN RELATION TO GRAVIDA



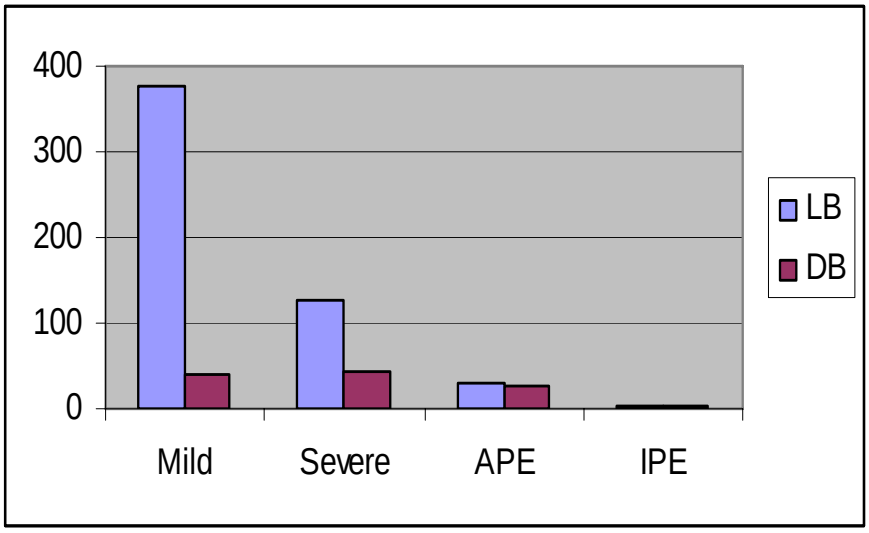


FETAL OUTCOME OF CASES IN RELATION TO SEVERITY

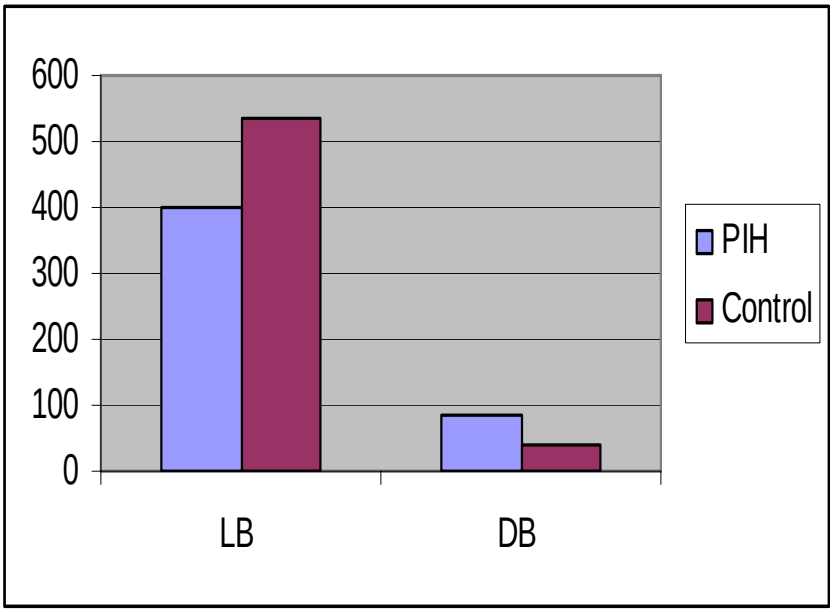


FETAL OUTCOME IN STUDY POPULATION

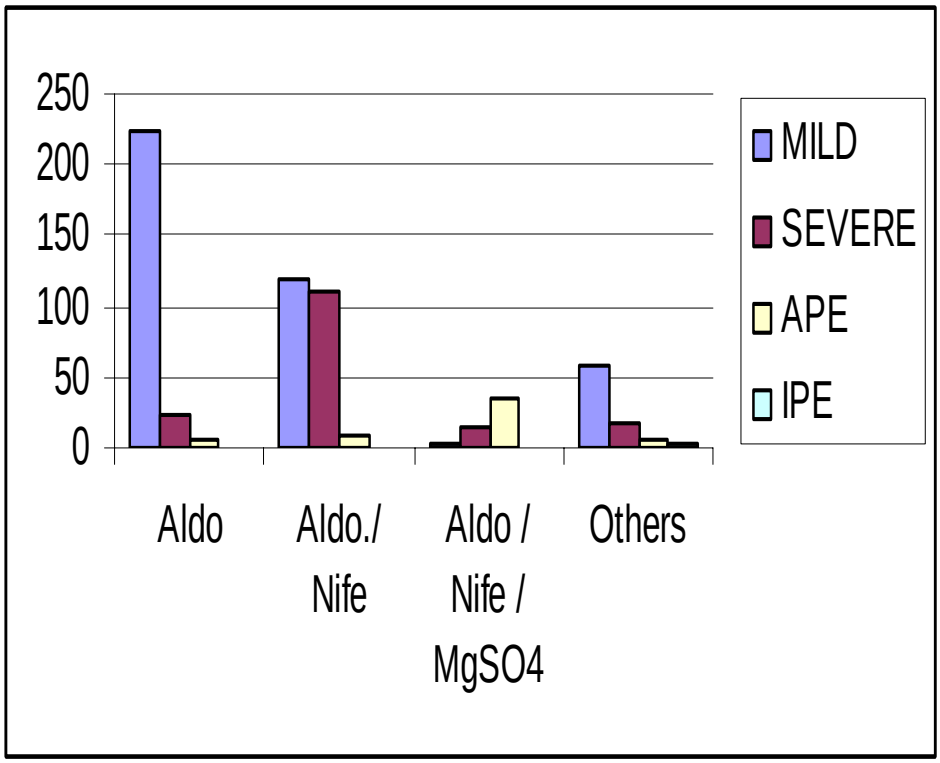
ASSOCIATED WITH RISK FACTORS



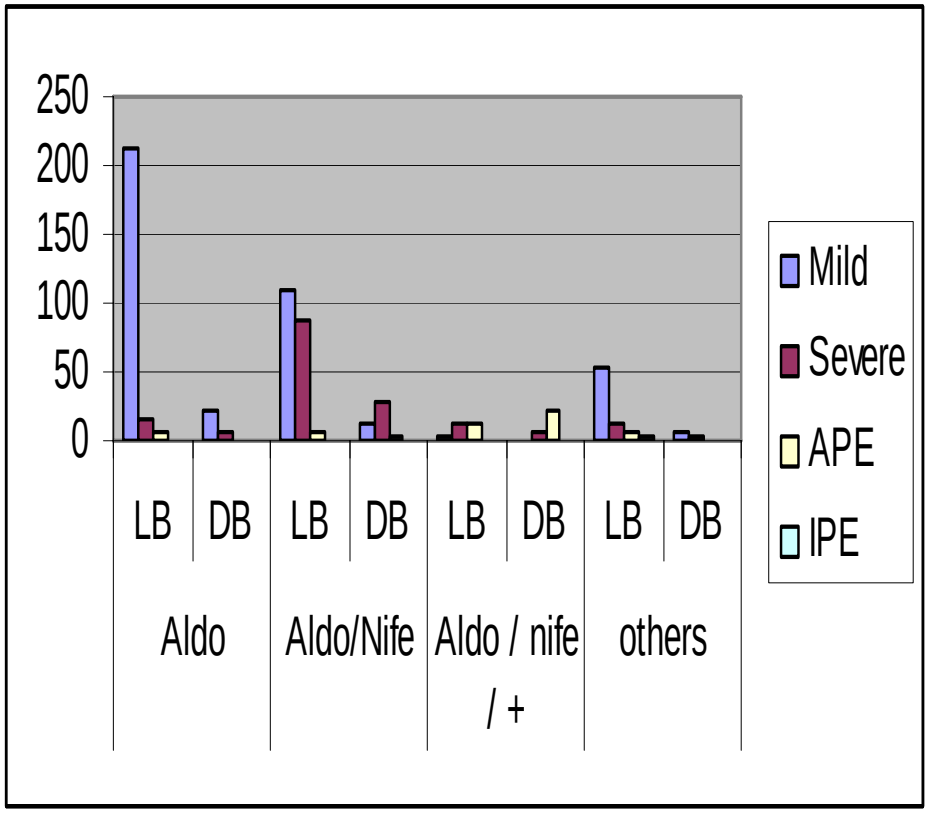
NOT ASSOCIATED WITH RISK FACTORS



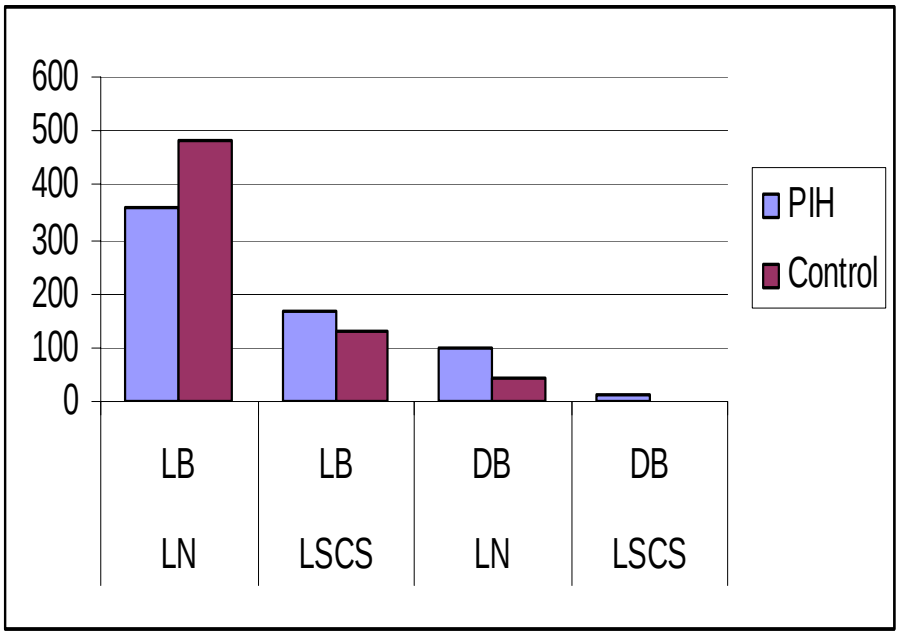
DRUGS RECEIVED IN CASE POPULATION



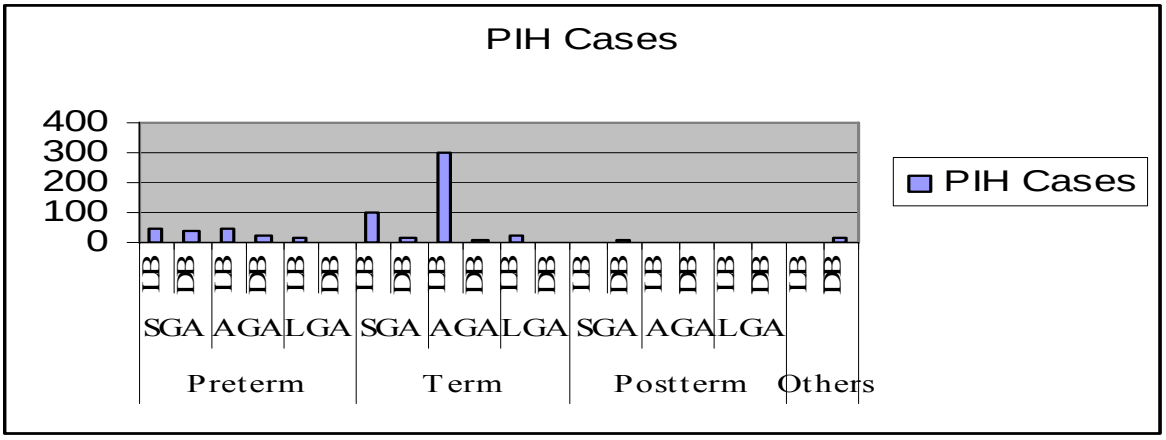
FETAL OUTCOME IN RELATION TO DRUGS RECEIVED IN CASE POPULATION

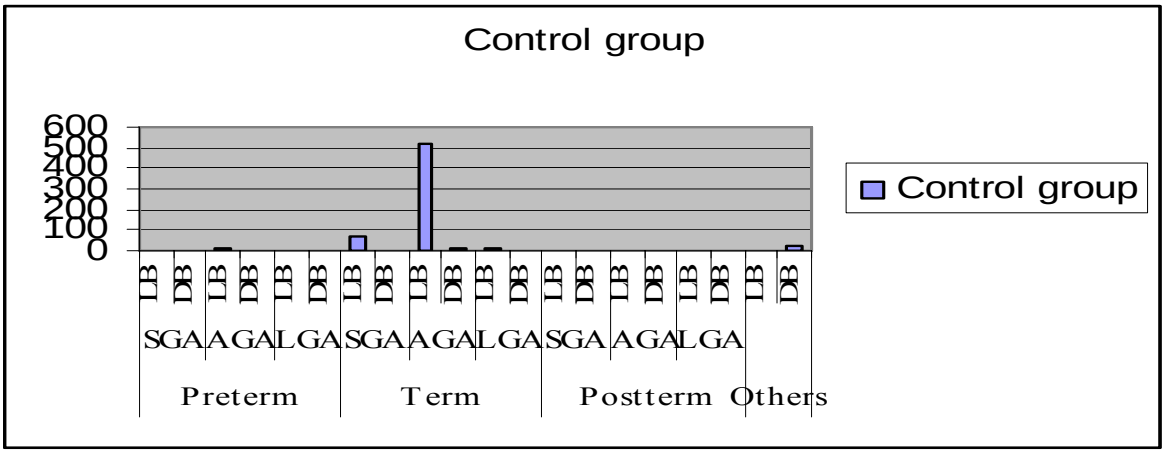


FETAL OUTCOME IN RELATION TO TYPE OF DELIVERY IN STUDY POPULATION



FETAL OUTCOME WITH MATURITY IN STUDY POPULATION





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